

Teacher Professional Development

Many experts assert that high-quality professional development should enhance student learning, but data for undertaking the requisite analysis are sparse. Almost all teachers participate in some form of professional development over the course of a year, most for the equivalent of a day or less. Teachers who spend more time in professional development activities are more likely to self-report improvements in classroom teaching as the result of these activities than are those who spend less time. Although several reports have asserted that teachers will perform better if they are given opportunities to sharpen their skills and keep abreast of advances in their fields (Henke, Chen, and Geis 2000; National Commission on Teaching and America's Future 1996), there has been no comprehensive assessment of the availability of such learning opportunities and the effects of those opportunities on teachers and students (Mullens et al. 1996; Smylie 1996). This section reviews participation in three types of professional development activities by mathematics and science teachers in 1999/2000:

- ♦ activities focused on indepth study of their content areas,
- ♦ activities focused on methods of teaching, and
- ♦ activities focused on the use of computers for teaching.

The amount of time teachers spent in these activities and whether they found them useful are also reviewed.

Nationally representative data on teacher quality, professional development, and working conditions have been collected by the National Center for Education Statistics' (NCES) 1999–2000 Schools and Staffing Survey. They were not available in time for the preparation of this chapter. Following release of the dataset by NCES, analyses of these topics will be available at the following National Science Foundation website: <http://www.nsf.gov/sbe/srs/seind02/update.htm>.

Observation of Other Teachers Teaching

Some research suggests that the experience of teachers observing other teachers can contribute to the sharing of good practices. TIMSS-R asked the mathematics and science teachers of U.S. 8th-grade students during the 1998/99 academic year about the number of class periods they observed other teachers during the past year and the number of periods other teachers observed them during the past year (NCES 2000f).¹¹ In general, the mathematics teachers of U.S. 8th-grade students rarely participated in observational activities. On average, U.S. 8th-grade students were taught by mathematics teachers who spent one class period during the 1998/99 academic year observing other teachers and who were observed by other teachers during two class periods. There were no

differences in the average number of class periods that mathematics teachers observed other teachers or were observed by other teachers based on years of teaching experience.

The science teachers of U.S. 8th-grade students also rarely participated in observational activities. On average, U.S. 8th graders were taught by science teachers who observed other teachers for one class period during the 1998/99 academic year and who were observed by other teachers for one class period. However, the situation was different for U.S. 8th-grade students whose science teachers had the fewest years of experience (0–5 years): their teachers spent approximately three periods observing other teachers, a greater number of periods than science teachers with more years of experience (NCES 2000f).

Teacher Working Conditions

Salaries for math and science teachers remain well below those of bachelor's and master's degree scientists and engineers in industry. Given that teacher retirements are on the rise, increased salaries provide a means of retaining good teachers and attracting the number of quality teachers needed to replace retirees. The difference between the annual median salaries of all bachelor's degree recipients and teachers has declined over the past 20 years, mainly due to increases in the relative size of the older teaching workforce and in salaries of older teachers. This section reviews how average teacher salaries have changed over the past quarter century, how the earnings of math and science teachers vary in high- and low-poverty schools, and, finally, how the salaries and teaching time of U.S. teachers compare with those of their counterparts in other countries.

Salary and teaching time are only two components of teacher working conditions. The amount of professional development time supported by a school or district, student behavior, participation in school decisionmaking, class size, quality of facilities, and adequacy of resources are examples of conditions that could also influence a teacher's desire to teach or not teach at a particular school. Many of these conditions, however, are either difficult to measure or do not have a parallel in S&E occupations outside teaching.

Trends in Teacher Salaries

As a wave of younger teachers hired in the mid-1970s has aged, a demographic shift in the age of teachers has occurred (NCES 1999a). For example, in 1975, 53 percent of all full-time teachers were younger than age 35; in 1993, the percentage of younger teachers fell to about 23 percent. By 1998, the percentage of younger teachers had risen only slightly, reaching 27 percent. Meanwhile, the percentage of full-time teachers age 45 years or older increased from about 26 percent in 1975 to 48 percent in 1998. (See figure 1-15.) Average teacher salaries have been affected by these demographic shifts, particularly over the past 20 years.

The annual median salaries (in constant 1998 dollars) of full-time teachers decreased between 1971 and 1981 by about

¹¹Questions regarding the professional development of teachers, including whether or not they had observed other teachers teaching in the previous year, were only asked of U.S. mathematics and science teachers in TIMSS-R.